

The herpetofaunal diversity of Takhar Province, Afghanistan

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Abstract

Takhar Province of Afghanistan was previously known to harbour only two species of amphibians and eight species of reptiles with no record of snake species. From 2020 to 2021, we collected herpetological data from the Province and identified 14 species and specimens representing species complexes (*Bufotes viridis* complex and *Trapelus agilis* complex), with first records of *Testudo horsfieldii* (Testudinidae), *Paralaudakia badakhshana* (Agamidae), *Pseudopus apodus* (Anguidae), *Tenuidactylus caspius* (Gekkonidae), *Eumeces schneideri* (Scincidae) and *Varanus griseus* (Varanidae). In addition, we report the first province records of snakes, including *Eryx tataricus* (Erycidae), *Hemorrhois ravergieri* (Colubridae), *Natrix tessellata* (Natricidae) and the venomous species *Naja oxiana* (Elapidae). These records connect and supplement previously obtained data of these species from surrounding provinces and neighbouring countries. Our data reveal that Takhar Province is home to at least 20 species of amphibians and reptiles with a strong affiliation to the Turanian chorotype. All these data are a significant source of information for the diversity of herpetofauna in Afghanistan and subsequent biodiversity research in the Central Asiatic region.

Key Words

Anguidae, Central Asia, Colubridae, Elapidae, Hindu Kush, Natricidae, new records, range extension, zoogeography

Introduction

The recent research related to the herpetofauna of Afghanistan, as well as its overall biodiversity, is very rarely available (Jablonski et al. 2021b). The reasons to such a hiatus in biodiversity research in Afghanistan is well-known worldwide (long-term security situation in the war and later post-war turmoil) and, thus, the advancement in creating and sustaining research environment is at the backstage. Since the publication of a review compiling museum specimens and related distribution data for amphibians and reptiles of the country (Wagner et al. 2016), only several studies have brought new information on biogeography, distribution, species com-

position (Jablonski et al. 2019b; Jablonski and Masroor 2021; Jablonski et al. 2021a, c, 2022) and even to evolutionary history or molecular taxonomy of amphibians and reptiles from populations reaching the Afghan territory, particularly genera *Bufotes*, *Eremias*, *Natrix* and *Naja* (Dufresnes et al. 2019; Kazemi et al. 2021; Khan et al. 2021; Masroor et al. 2022; Jablonski et al. 2023). These preceding works were related to the overall species distribution and diversity of the country with a marginal impact on regional or provincial data. Only recently, a publication, based on random observations of herpetofauna in Kunduz Province has been published (Jablonski et al. 2021e). The study provided recent observations on five species of amphibians and reptiles with the first formal

record of *Varanus griseus caspius* (Eichwald, 1831) for Kunduz Province. Detailed and recent data focusing on other provinces of Afghanistan are, however, almost non-existent (see Jablonski et al. (2019b)).

The overall knowledge of the species composition of amphibians and reptiles of Takhar Province comes from the collection of Richard Clark who visited Takhar in 1968 (Clark 1990). Between 28 and 29 April 1968, he collected specimens that are now stored at the California Academy of Sciences, USA (CAS). Earlier in 1964, a small collection of *Trapelus agilis* was made by Clas M. Naumann (1939–2004), lepidopterist and founder of the Zoological Museum in Kabul (Naumann and Nogge 1973). The collection is now in the Museum Koenig (ZFMK), Bonn, Germany under voucher numbers ZFMK 8594–97. As summarised in Wagner et al. (2016), Takhar Province is, according to the previous knowledge, inhabited by the amphibians, including the *Bufo* *viridis* species complex (Bufonidae) (probably *Bufo turanensis*), *Pelophylax terentivevi* (Ranidae) and reptiles represented by *Paralaudakia caucasia*, *P. lehmanni*, *Trapelus agilis*, *T. sanguinolentus* (Agamidae), *Tenuidactylus turkmenicus* (Gekkonidae), *Eremias nigrocelata*, and *E. velox* (Lacertidae). Recently, Jablonski et al. (2021a) provided data on the presence of *Laudakia muristanica* (Anderson & Leviton, 1969) from the central parts of the Province. These published data suggest that the herpetofauna of Takhar Province is formally composed of two species of amphibians (although the *Bufo* *viridis* complex is probably represented by several species; cf. Dufresnes et al. (2019) and comment below) and eight species of reptiles. Surprisingly, no snake species have been recorded for the Province so far. Whereas we recently herpetologically explored Takhar Province and collected valuable information, we present our results in the context of our recent findings and previously published field and museum data.

Materials and methods

Takhar Province lies in the north-eastern part of Afghanistan and borders Tajikistan (Fig. 1). The four Provinces, Badakhshan, Panjshir, Baghlan and Kunduz share their borders with Takhar (Fig. 1). This Province is also unique in the sense that it is covered by different types of habitats with a large difference in altitude from lowlands of the Panj River (ca. 450 m a.s.l.) to Qulah-ye Shakarāw Mountain (5818 m a.s.l.) that is the highest point of the Province. Thus, habitats are formed by mountain landscapes (Hindu Kush) in the south and hilly or lowland areas (mostly of semi-desert or desert features, steppes and agricultural fields) in the central and northern parts. According to Olson et al. (2001), the main ecoregions in Takhar Province include Hindu Kush alpine meadows and *Paropamisus* xeric woodlands and border areas of the Province on the Panj River have been suggested as Darqad Wildlife Reserve (Johnson et al. 2012). Due to its geographic position and variety of different habitats and landscapes, Takhar Province represents an interesting, but underestimated area for biodiversity research.

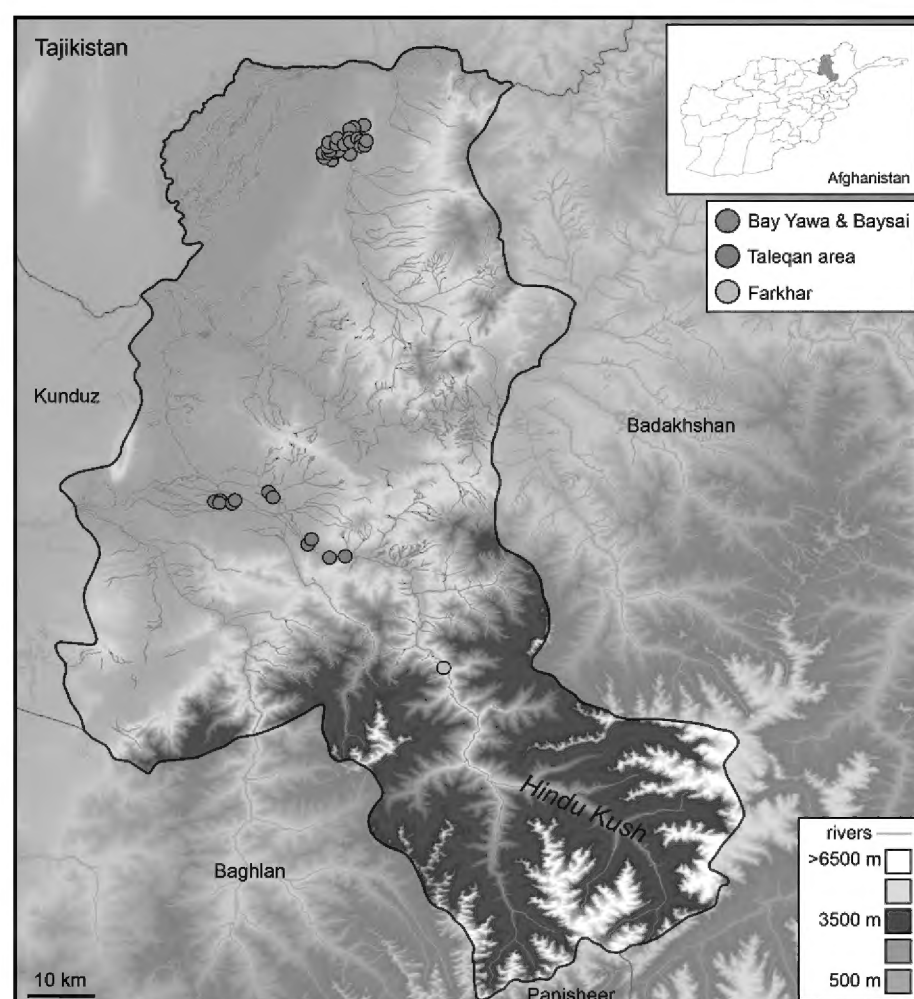


Figure 1. Herpetologically investigated localities of Takhar Province, Afghanistan.

During 2020 and 2021, we collected herpetological data from Takhar Province, northern Afghanistan (Fig. 1) in different areas (27 localities with 60 points of original coordinates) and habitats of the Province (Fig. 2). These data were collected by direct observations in the field, mostly from spring to autumn. Some data were supplemented from observations of local people if these observations were well supported with clear species descriptions and photos. Besides species identifications, we collected date of observation, the number of observed individuals, their age and sex, exact locality using geographic coordinates and the name of the closest village, elevation, type of the habitat, as well as other pertinent information. When possible, photographic vouchers were taken and archived in the Comenius University Herpetological Collection, Bratislava, Slovakia (CUHC-PA) under numbers CUHC-PA 160–222. The obtained data were compared with the correct and updated dataset of localities and coordinates of Afghan amphibians and reptiles (Jablonski, pers. data) published by Wagner et al. (2016), citizen-science data (GBIF—the Global Biodiversity Information Facility) and subsequent studies on Afghan herpetofauna published afterwards (see Results and Discussion). Due to significant differences in morphology and ecology, we follow the taxonomy of Baig et al. (2012) and Wagner et al. (2016) for genera *Laudakia* and *Paralaudakia*. This split is doubtful for some authors (Pyrón et al. 2013), but in the same way genetically arguable and, thus, needs further investigations. The observed species were also classified according to the chorotype classification of Vigna Taglianti et al. (1999), and modified sensu Sindaco and Jeremčenko (2008) and Sindaco et al. (2013). The distribution data were visualised using QGIS Desktop 3.20.1 software (2022) and present-



Figure 2. Eco-physiographic habitats of Takhar Province, Afghanistan: **A.** Bay Yawa (Qizilqiye), habitat of *Naja oxiana*; **B.** Bay Yawa (Chanqutan), habitat of *Pseudopus apodus*, *Varanus griseus* and *Testudo horsfieldii*; **C.** Bay Yawa, agricultural fields, habitat of the *Bufotes viridis* complex and *Pelophylax terentievi*; **D.** vicinity of Bay Yawa Village.

ed into final maps, updated with new records for Takhar Province. The input data with geographic coordinates for species and source references, resulting to the here-presented map outputs, are provided in Suppl. material 1.

The following museum/collection abbreviations were used throughout the text (sensu Sabaj (2020)):

BMNH	(nowadays NHMUK) The Natural History Museum (formerly British Museum of Natural History), London, United Kingdom.
CAS	California Academy of Sciences, San Francisco, USA.
CUHC	Comenius University Herpetological Collection, Bratislava, Slovakia.
FMNH	Field Museum of Natural History, Chicago, USA.
MZLU	Zoologiska Museet, Lunds Universitet, Lund, Sweden.
NMW	Naturhistorisches Museum, Wien, Austria.
ZFMK	Leibniz-Institut zur Analyse des Biodiversitätswandels, former Zoologisches Forschungsmuseum Alexander Koenig, Bonn, Germany.
ZMUC	Københavns universitet Zoologisk Museum, Copenhagen, Denmark.

Results

AMPHIBIA

Anura

Bufonidae

Bufotes viridis (Laurenti, 1768) complex*

Figs 3, 4A–C

Takhar records. Taleqan (Gulayi Bagh), 36.4433°N, 69.3058°E; 792 m a.s.l., 31 January 2020, found dead in grassy habitat near stream, one individual of unknown sex (CUHC-PA 197); Taleqan (Takhar University Campus), 36.7427°N, 69.5162°E, 792 m a.s.l., 8 May 2020, garden near stream, one adult female (CUHC-PA 168); Taleqan (Takhar University Campus), 36.7420°N, 69.4860°E, 800 m a.s.l., 16 May 2020, open field, one subadult female (CUHC-PA 167); Taleqan (Pusthur), 36.7607°N, 69.5793°E, 899 m a.s.l., 18 May 2020, semi-desert area, one subadult individual of unknown sex (CUHC-PA 189); Taleqan (Gulayi Bagh), 36.7386°N, 69.5101°E, 794 m a.s.l., 28 May 2020, garden near stream, two adult females (CUHC-PA 173).

Distribution in Afghanistan. Badakhshan, Badghis, Balkh, Bamiyan, Faryab, Ghazni, Herat, Kabul, Kandahar, Kunduz, Laghman, Logar, Nangarhar, Parwan,

* In the studied area possibly including *Bufotes baturae* (Stöck, Schmid, Steinlein & Grosse, 1999); *Bufotes perrini* Mazepa, Litvinchuk, Jablonski & Dufresnes, 2019; *Bufotes pewzowi* (Bedriaga, 1898), *Bufotes turanensis* (Hemmer, Schmidtler & Böhme, 1978).

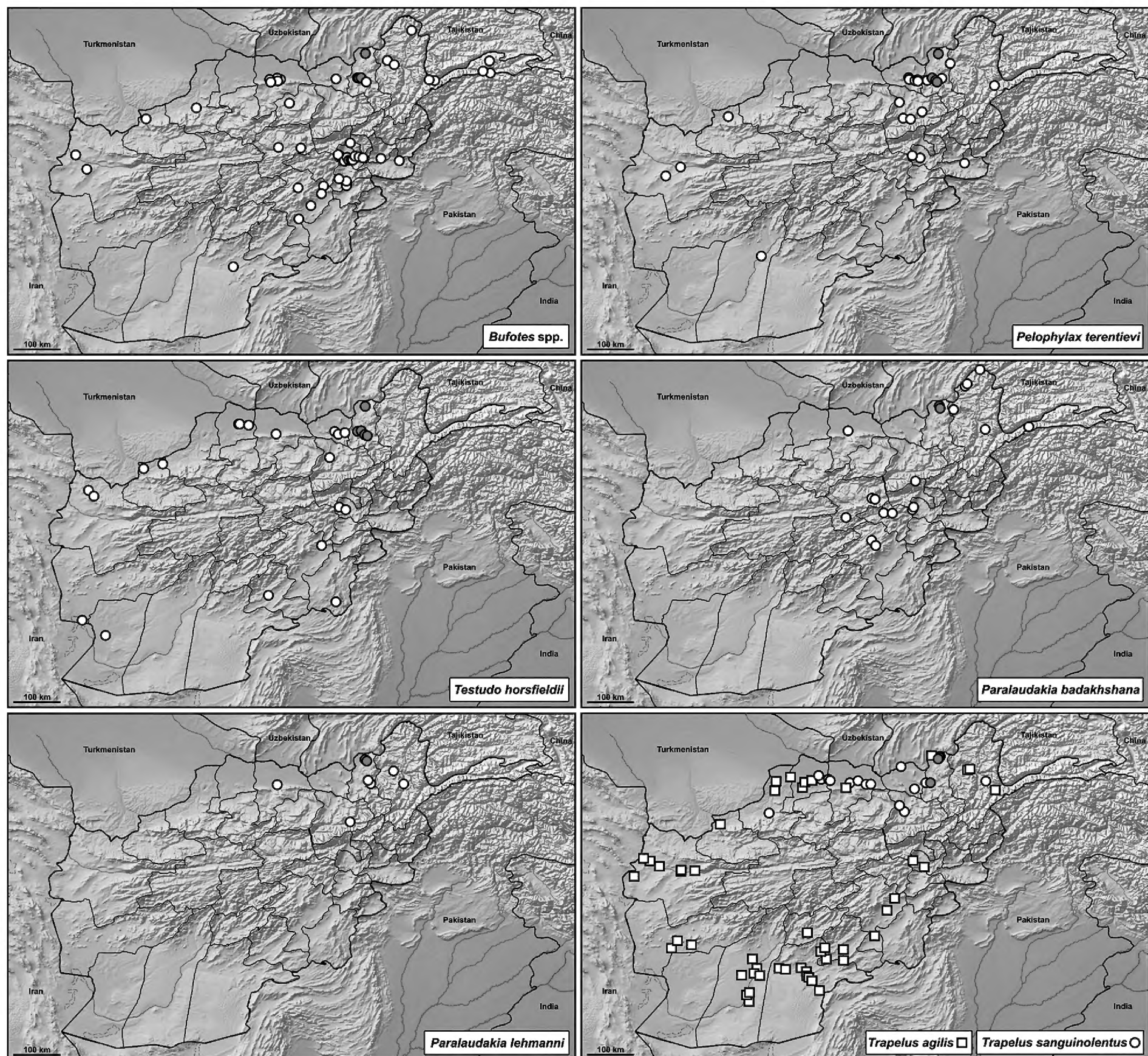


Figure 3. Herpetofaunistic records of Bufonidae, Ranidae, Testudinidae and Agamidae from Takhar Province in the context of updated records from Afghanistan (white dots or squares: published data (except for the data on *Bufo oblongus* and *B. zugmayeri*, which are distributed in SW Afghanistan); red dots: new data).

Samangan, Takhar, Wardak (Wagner et al. 2016; Dufresnes et al. 2019; Jablonski et al. 2019a, b) Provinces, representing distribution in 50% of all Afghan Provinces.

Chorotype. *Bufo turanensis* is the most likely species found in Takhar Province and belongs to the Turanian chorotype.

Remarks. The most comprehensive overview based on different types of data, but mostly genetics, has been provided by Dufresnes et al. (2019). According to these authors, *B. pewzowi*, *B. baturae*, *B. turanensis* and *B. perini* are or may be present in northern Afghanistan and thus possibly in Takhar Province. Nevertheless, it is necessary to verify this through DNA-based approaches on a more comprehensive sampling of these toads collected from various locations within Afghanistan – most of data used by the published paper originated from the border areas of Tajikistan and Uzbekistan; see fig. S4 in Dufresnes et al. (2019). Individuals that we photographed resemble

B. turanensis that was mentioned from Takhar Province as a single specimen from Taleqan (CAS 120973; Wagner et al. 2016). In such case, our observations provide the second confirmation of this species for the Province.

Ranidae

Pelophylax terentievi (Mezhzherin, 1992)

Figs 3, 4D–F

Takhar records. Taleqan (Gulayi Bagh), 36.4433°N, 69.3058°E; 792 m a.s.l., 31 January 2020, found dead in grassy habitat near stream, one individual of unknown sex (CUHC-PA 198); Bay Yawa (Baghi Mullah Gulmad), 37.4379°N, 69.7121°E, 670 m a.s.l., 31 March 2020, irrigation channels and pools, one adult female (CUHC-PA 186); Bya Yawa, 37.4311°N, 69.7185°E, 666 m a.s.l., 27 April

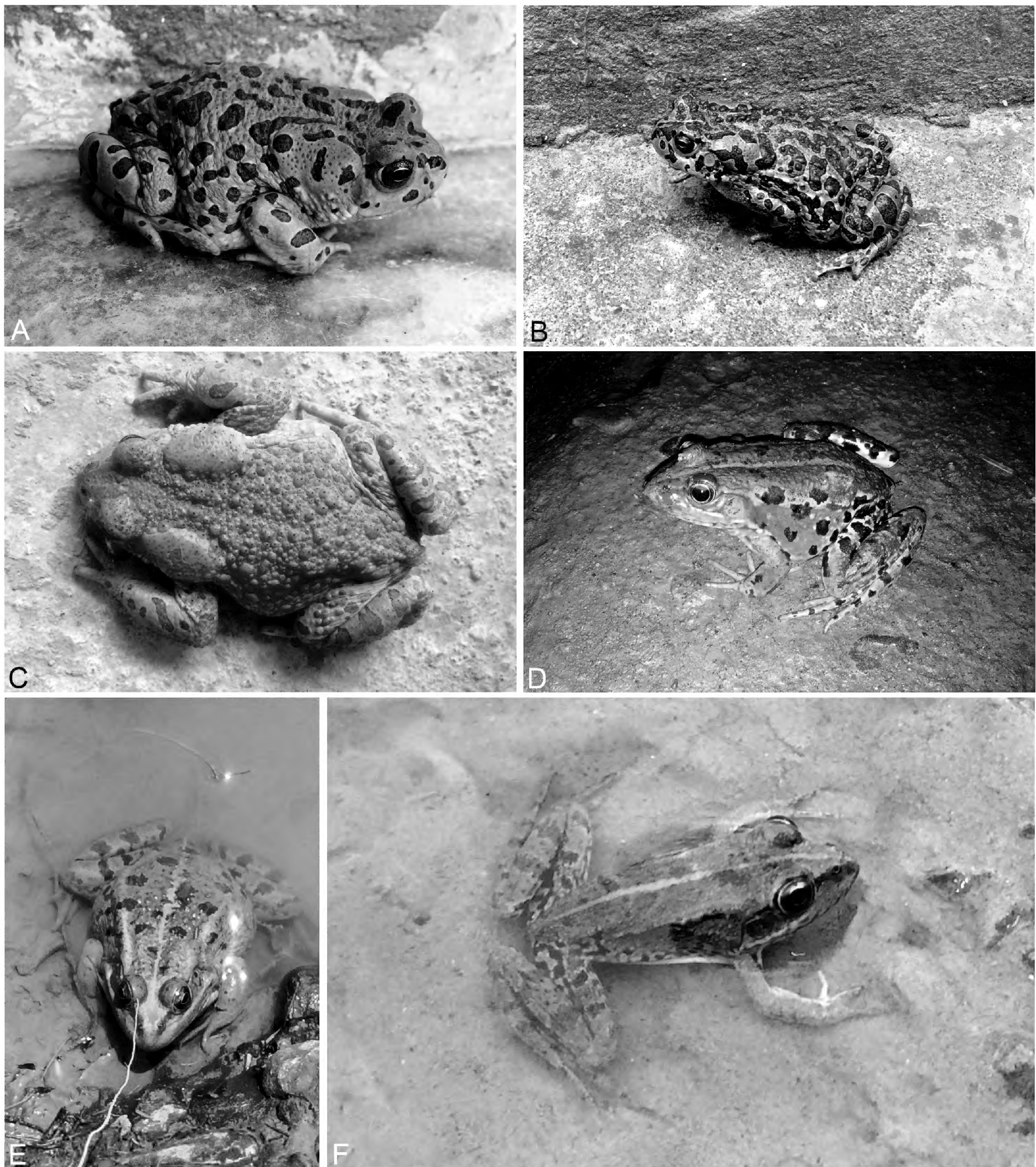


Figure 4. A. Adult individual of the *Bufotes viridis* complex from Taleqan (CUHC-PA 167); B. Adult female of the *B. viridis* complex from Taleqan (CUHC-PA 168); C. Adult female of the *B. viridis* complex from Taleqan (Gulayi Bagh) (CUHC-PA 173); D. Adult female of *Pelophylax terentievi* from Taleqan (Gulayi Bagh) (CUHC-PA 170); E. Adult male of *P. terentievi* from Takatuymaz (Tangi Farkhar) (CUHC-PA 171); F. Subadult individual of *P. terentievi* from Bay Yawa (Parchaw Khana) (CUHC-PA 215).

2020, rice field, one adult female (CUHC-PA 166); Taleqan (Khitayan), 36.6590°N, 69.6565°E, 927 m a.s.l., 10 May 2020, rice field, three adult males (CUHC-PA 169); Taleqan (Gulayi Bagh), 36.7426°N, 69.5162°E, 794 m a.s.l., 12 May 2020, during the middle of the night in the garden, one adult female (CUHC-PA 170); Takatuymaz (Tangi Farkhar), 36.6326°N, 69.6969°E, 982 m a.s.l., 13 May 2020, irrigation channels and pools, one adult and three juveniles of both sexes (CUHC-PA 11); Bay Yawa (Parchaw Khana),

37.4272°N, 69.7209°E, 680 m a.s.l., 29 May 2020, Prut River vicinity; one subadult of unknown sex (CUHC-PA 187); Bay Yawa (Parchaw Khana), 37.4287°N, 69.7199°E, 675 m a.s.l., 4 September 2021, canal, one subadult of unknown sex (CUHC-PA 204); Bay Yawa (Parchaw Khana), 37.4254°N, 69.7215°E, 688 m a.s.l., 14 September 2021, canal, one subadult of unknown sex (CUHC-PA 215).

Distribution in Afghanistan. Badakhshan, Badghis, Baghlan, Helmand, Herat, Kabul, Kunduz, Nangarhar

and Takhar Provinces (Wagner et al. 2016; Jablonski et al. 2021c, e), representing 26% of all provinces.

Chorotype. Turanian.

Remarks. *Pelophylax terentievi* is one of the ranid frogs that was originally reported from Takhar Province under the name *Rana ridibunda* Pallas, 1771 (Clark 1990). It was mentioned as an extremely abundant species living in streams, ponds and irrigation ditches (Clark 1990) which corresponds to our observations. The distribution of this species follows the Panj River, a tributary of the Amu Darya River. However, this species has also been reported from other parts of Afghanistan, even south of the Hindu Kush range [for review, see Jablonski et al. (2021c)].

REPTILIA

Testudines

Testudinidae

Testudo horsfieldii Gray, 1844

Figs 3, 5A, B

Takhar records. Bay Yawa (Khagebilendi), 37.4058°N, 69.6853°E, 1124 m a.s.l., 2, 4, 12, 21 and 22 April 2020, grassy habitat, tens of individuals from juveniles to adults of both sexes (CUHC-PA 179); Taleqan (Takhar University Campus), 36.7405°N, 69.4803°E, 792 m a.s.l., 5 May 2020, grassy habitat, tens of individuals from juveniles to adults of both sexes (CUHC-PA 178); Taleqan (Khitayan), 36.6638°N, 69.6580°E, 980 m a.s.l., 13 May 2020; grassy habitat, tens of individuals from juveniles to adults of both sexes (CUHC-PA 181); Tangi Farkhar, 36.6353°N, 69.7264°E, 1039 m a.s.l., 13 May 2020, grassy habitat, tens of individuals from juveniles to adults of both sexes (CUHC-PA 182); Taleqan (Pusthur), 36.7492°N, 69.5869°E, 814 m a.s.l., 18 May 2020, grassy habitat, tens of individuals from juveniles to adults of both sexes (CUHC-PA 180).

Distribution in Afghanistan. Badghis, Baghlan, Balkh, Farah, Ghazni, Herat, Jowzjan, Kabul, Kunduz, Nimroz, Paktika and Zabul Provinces (Wagner et al. 2016; Jablonski et al. 2019b, 2021e), representing 35% of all provinces.

Chorotype. Turanian.

Remarks. We provide the first record of *T. horsfieldii* for Takhar Province. These are currently the easternmost records of the species in Afghanistan. The geographically closest records are from Kunduz Province, ca. 30 km by air distance westwards (Jablonski et al. 2021e).

Squamata

Agamidae

Paralaudakia badakhshana (Anderson & Leviton, 1969)

Figs 3, 5C–E

Takhar records. Khilyazi bala Village, 37.4684°N, 69.7585°E, 897 m a.s.l., 13 September 2021, rocky habitat, one adult male (CUHC-PA 212); Khilyazi bala,

37.4682°N, 69.7609°E, 927 m a.s.l., 13 September 2021, rocky habitat, one adult individual of unknown sex (CUHC-PA 213); Khilyazi bala Village, 37.4252°N, 69.7648°E, 884 m a.s.l., 15 September 2021, one sub-adult individual of unknown sex (CUHC-PA 218).

Distribution in Afghanistan. Badakhshan, Baghlan, Balkh, Bamiyan, Ghazni, Kabul, Parwan, Takhar, Wardak Provinces (Moheb and Mostafawi 2012; Wagner et al. 2016; Jablonski et al. 2019a), representing 26% of all provinces.

Chorotype. Western Central-Asiatic Mountains.

Remarks. We provide the first species records of this taxon for Takhar Province. It is an endemic species for Afghanistan and has never been genetically studied. It is possible that some historical distribution points (e.g. from Ghazni, specimens ZFMK 8608–12 and 13315–16) may represent different species and the range may change in future. Additionally, the type locality “Mazar-i-Sharif, northern Afghanistan, 36°34'N, 67°05'E, 457 m elevation” is challenged by some authors (Baig et al. 2012). Thus, DNA genotyping and detailed morphological examination of Afghan populations (presumably belonging to *P. badakhshana*), are necessary to further investigations.

Paralaudakia lehmanni (Nikolskii, 1896)

Figs 3, 5G–I

Takhar records. Bay Yawa Sharqi (Tundi Aman), 37.4223°N, 69.7543°E, 794 m a.s.l., 15 September 2021, rocky habitat, one adult male (CUHC-PA 216); Bay Yawa Sharqi, 37.4248°N, 69.7633°E, 871 m a.s.l., 15 September 2021, rocky habitat, one adult male (CUHC-PA 217); Bay Yawa Sharqi (Latakhali), 37.4322°N, 69.7399°E, 737 m a.s.l., 15 September 2021, rocky habitat, one sub-adult individual of unknown sex (CUHC-PA 222).

Distribution in Afghanistan. Badakhshan, Baghlan, Balkh (Wagner et al. 2016) and Takhar Provinces, representing 12% of all provinces.

Chorotype. Western Central-Asiatic Mountains.

Remarks. This study provides the first records of this species for Takhar Province. Same as for *P. badakhshana*, we have no information on genetics of this species from Afghanistan. It is a widely distributed lizard in Central Asia, distributed from middle to high elevations (Baig et al. 2012). The geographic coordinates 33.422272°N, 63.662567°E given for the locality “Darrah-e-Andarab, vic. of Bani [Baghlan Prov., 2100 m]” located in Ghor Province (Wagner et al. 2016) are wrong and, thus, are corrected here to Andarab Valley in Baghlan Province, approx. 35.6265°N, 69.2152°E.

Paralaudakia sp.

Fig. 5F

Takhar records. Khilyazi bala Village, 37.4687°N, 69.7584°E, 912 m a.s.l., 13 September 2021, rocky habitat, one adult male (CUHC-PA 214).

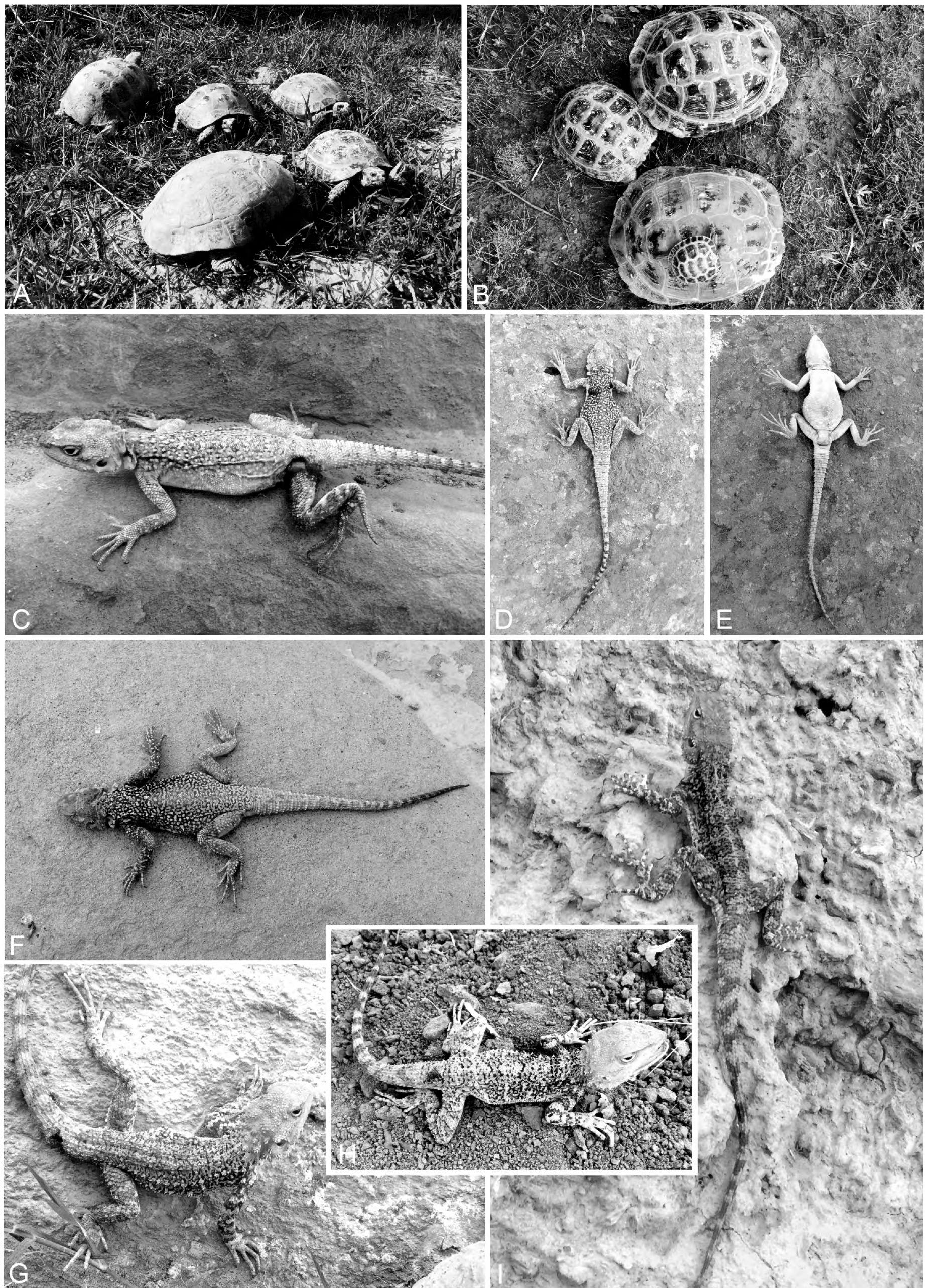


Figure 5. A, B. Individuals of *Testudo horsfieldii* from Bay Yawa (Khagebilendi) of different sex and ages (CUHC-PA 179); C. Adult male of *Paralaudakia badakhshana* from Khilyazi bala (CUHC-PA 212); D, E. Ventral and dorsal view on the individual of *P. badakhshana* from Khilyazi bala (CUHC-PA 213); F. Individual of *Paralaudakia* sp. from Khilyazi bala (CUHC-PA 214); G, H. Adult males (CUHC-PA 216 and 217) of *Paralaudakia lehmanni* from Khilyazi bala; I. Subadult individual of *P. lehmanni* from Bay Yawa (CUHC-PA 222).

Remarks. The observation of this individual is from the area where we observed *P. badakhshana* and *P. lehmanni*. However, the morphology of the specimen does not correspond to that of any of the two mentioned species. Until the species status is confirmed, we keep this record as *Paralaudakia* sp. It is a speculative explanation now, but this specimen may represent a hybrid between the two species of *Paralaudakia* distributed in the area. This needs further field investigations and subsequent genetic research.

Trapelus agilis* (Olivier, 1804) complex

Figs 3, 7A, B

Takhar records. Taleqan (Taqhar University Campus), 36.7408°N, 69.4858°E, 794 m a.s.l., 26 March 2019, grassy habitat, one adult individual of unknown sex (CUHC-PA 190); Bay Yawa (Tally Dere), 37.4128°N, 69.6939°E, 910 m a.s.l., 4 April 2020, semi-desert habitat in rocky area, one adult individual of unknown sex (CUHC-PA 191); Bay Yawa (Tashqutan), 37.4234°N, 69.6975°E, 877 m a.s.l., 2 September 2021, semi-desert habitat, one subadult individual of unknown sex found under a stone (CUHC-PA 202); Bay Yawa (Baghi Mullah Gulmad), 37.4292°N, 69.7210°E, 736 m a.s.l., 10 September 2021, semi-desert habitat, one adult male (CUHC-PA 207); Khilyazi payan near the primary school, 37.4552°N, 69.7361°E, 756 m a.s.l., 13 September 2021, rocky habitat near small stream, one adult individual of unknown sex (CUHC-PA 210).

Distribution in Afghanistan. This species complex (Shahamat et al. 2020) is distributed through Afghanistan. *Trapelus agilis* is mentioned from the Provinces of Badakhshan, Badghis, Balkh, Farah, Faryab, Ghazni, Helmand, Herat, Jowzjan, Kabul, Kandahar, Takhar, Uruzgan and Zabul (Wagner et al. 2016; Jablonski et al. 2019a, b), representing 41% of all provinces. *Trapelus sanguinolentus* is exclusively known from provinces north of Hindu Kush Mountains, i.e., Badakhshan, Baghlan, Balkh, Faryab, Jowzjan, Kunduz, Samangan and Takhar (Wagner et al. 2016; Jablonski et al. 2021e), representing 24% of all provinces.

Chorotype. Iranian + Turanian, and Sindhian (*T. agilis*).

Remarks. Based on external morphology and distribution of individuals, the observations from Takhar Province represent *T. sanguinolentus*. However, due to morphological similarities and the fact that both species are known in the literature from Takhar Province (specimens CAS 120275 and ZFMK 8594–97; Wagner et al. (2016)), we consider our identification as preliminary, pending genetic confirmation that is missing from this part of Central Asia (cf. Shahamat et al. (2020)). The geographic position for specimens ZMUC R-36133, ZMUC R-36161, ZMUC R-36150–55, ZMUC 36204–05, ZMUC R-36146–48 and 36156–57 was corrected from those mentioned by Wagner et al. (2016), based on the database of ZMUC. Additionally, the geographic position of specimens CAS

90765–66 and CAS 90777 is corrected, based on the data of CAS (Jablonski, pers. data).

Anguidae

***Pseudopus apodus* ssp. *apodus* (Pallas, 1775)**

Figs 6, 7C, D

Takhar records. Bay Yawa, 37.4309°N, 69.7289°E, 681 m a.s.l., 11 April 2019, garden, two adult females (CUHC-PA 185); Bay Yawa, 37.4218°N, 69.6955°E, 911 m a.s.l., 12 April 2020, grassland, one juvenile of unknown sex (CUHC-PA 160); Bay Yawa (Shamal Dere), 37.4288°N, 69.6938°E, 968 m a.s.l., 15 April 2020, observed early in the day in and close to holes of the highly cultivated, open area, adult male (CUHC-PA 161); Bay Yawa (Shamal Dere), 37.4249°N, 69.6929°E, 936 m a.s.l., 15 April 2020, observed early in the day in and close to holes of the highly cultivated, open area, one adult of unknown sex (CUHC-PA 162); Bay Yawa (Tashqutan), 37.4186°N, 69.7083°E, 797 m a.s.l., 21 April 2020, cultivated, open area, one adult female (CUHC-PA 163); Bay Yawa (Keserkul), 37.4259°N, 69.7161°E, 731 m a.s.l., 21 April 2020, cultivated, open area, one adult male (CUHC-PA 164); Bay Yawa (Taqcha), 37.4005°N, 69.6980°E, 956 m a.s.l., 23 April 2020, cultivated, open area, one adult female (CUHC-PA 165).

Distribution in Afghanistan. The species is known from Badakhshan, Badghis, Baghlan, Farah and Herat Provinces, representing 15% of all provinces.

Chorotype. Mediterranean + Iranian + Turanian.

Remarks. The present record is the first-ever observation of this species for Takhar Province. The importance of this record is that it represents a connection to the unexpected, highly elevated record of the species from Badakhshan Province (locality Zebak, 2653 m a.s.l. from 18 August 1965; specimens FMNH 161121–22; Anderson and Leviton (1969)). It suggests that *P. apodus* could colonise warmer river valleys in the mountains from areas with higher population densities. More records are, thus, expected in the future from the north Provinces, such as Balkh, Faryab, Jowzjan or Kunduz, where this steppe and grassland species, surprisingly, has never been recorded (Jablonski et al. 2021e). The subspecies *P. a. apodus* (Pallas, 1775) is present in Central Asia and Afghanistan (see Jablonski et al. (2021d)).

Gekkonidae

***Tenuidactylus caspius* (Eichwald, 1831)**

Figs 6, 7E

Takhar record. Bay Yawa, 37.4272°N, 69.7109°E, 725 m a.s.l., 31 January 2021, semi-desert habitat with bushes and burrows, hiding under stone, one subadult individual (CUHC-PA 192).

* Including *Trapelus sanguinolentus sanguinolentus* (Pallas, 1827).

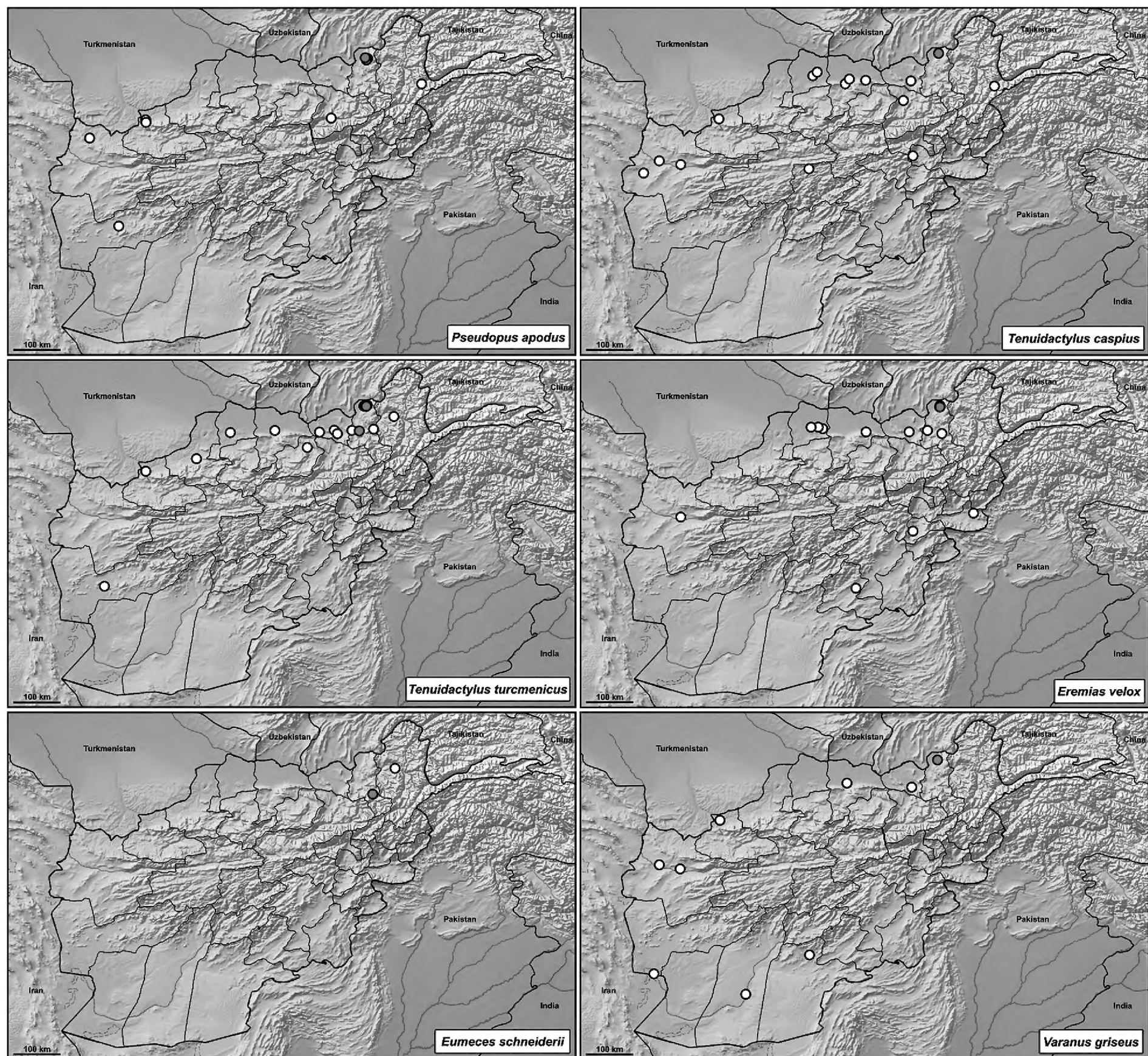


Figure 6. Herpetofaunistic records of Anguidae, Gekkonidae, Lacertidae, Scincidae and Varanidae from Takhar Province in the context of updated records from Afghanistan (white dots: published data; red dots: new data).

Distribution in Afghanistan. It is known from the Provinces of Badakhshan, Badghis, Baghlan, Balkh, Daykundi, Herat, Jowzjan, Kabul, Kunduz (Wagner et al. 2016; Jablonski et al. 2019) and Takhar, representing 26% of all provinces.

Chorotype. Turanian.

Remarks. We report this species for the first time from Takhar Province. The species is distributed mostly in northern provinces. Records from Badakhshan (CAS 115945, FMNH 161130), Daykundi (MZLU L957/3792) and Kabul (FMNH 161063) need further clarification as they represent highly elevated or records out of the main distribution range of the species. On the other hand, we identified that the specimen ZFMK 94240 represents *T. caspius* that was not mentioned in Wagner et al. (2016). This specimen represents the first record for Kunduz Province (36.6735°N, 68.9034°E, Kunduz army camp; cf. Jablonski et al. (2021e)) and a connection point to re-

cord from Takhar Province and possibly to record from Zebak (2653 m a.s.l.), Badakhshan (FMNH 161130, CAS 115945; Anderson and Leviton (1969)).

***Tenoidactylus turcmenicus* (Szczerbak, 1978)**

Figs 6, 7F–H

Takhar records. Taleqan (Gulayi Bagh), 36.7426°N, 69.5163°E, 791 m a.s.l., 31 May 2020, wall of a house in the village, one adult individual of unknown sex (CUHC-PA 183); Bay Yawa (Qizilqiya), 37.4301°N, 69.7150°E, 694 m a.s.l., 2 September 2021, sandy cave, one adult individual of unknown sex (CUHC-PA 200); Bay Yawa (Qizilqiya), 37.4289°N, 69.7136°E, 703 m a.s.l., 2 September 2021, sandy cave, one adult individual of unknown sex (CUHC-PA 201); Bay Yawa (Sukhtedere), 37.4084°N, 69.6967°E, 834 m a.s.l., 2 September 2021,

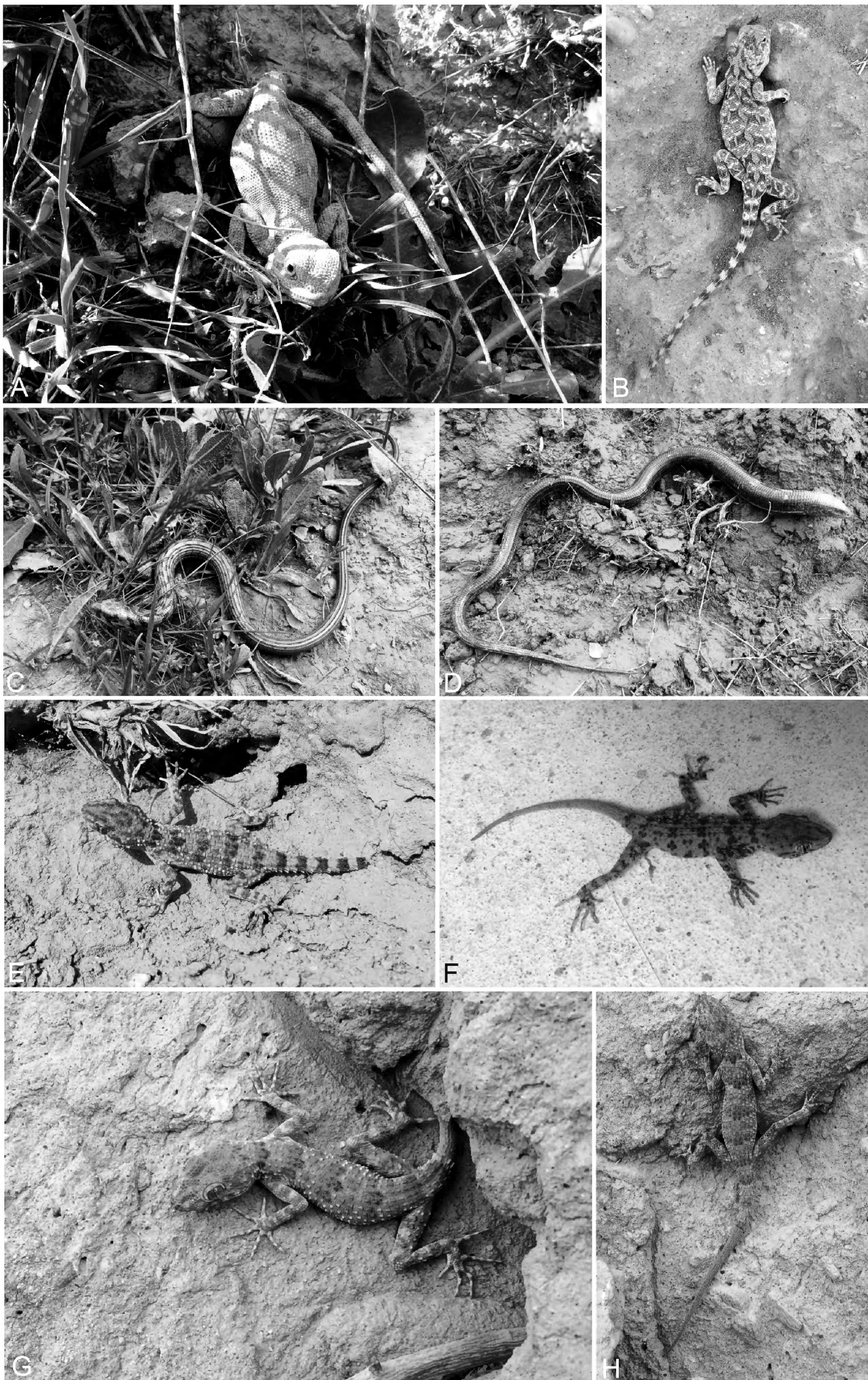


Figure 7. A. Adult individual of the *Trapelus agilis* complex from Bay Yawa (Tally Dere) (CUHC-PA 191); B. Adult individual of the *T. agilis* complex Khilyazi payan (CUHC-PA 210); C. Juvenile individual of *Pseudopus apodus* from Bay Yawa (CUHC-PA 160); D. Adult male of *P. apodus* from Bay Yawa (Shamal Dere) (CUHC-PA 161); E. Subadult individual of *Temnidactylus caspius* from Bay Yawa (CUHC-PA 192); F. Adult individual of *Temnidactylus turcomenicus* from Taleqan (Gulayi Bagh) (CUHC-PA 183); G. Adult individual of *T. turcomenicus* from Bay Yawa (Qizilqiya) (CUHC-PA 200); H. Adult individual of *T. turcomenicus* from Khilyazi payan (CUHC-PA 211).

stony habitat, five observed individuals of unknown sex (CUHC-PA 203); Khilyazi Payan, 37.4384°N, 69.7319°E, 705 m a.s.l., 13 September 2021, sandy stones, one subadult individual of unknown sex (CUHC-PA 208); Bay yawa sharqi (Tundi Aman), 37.4568°N, 69.7385°E, 777 m a.s.l., 13 September 2021, sandy stones, one adult individual (CUHC-PA 211); Khilyazi payan, 37.4273°N, 69.7650°E, 947 m a.s.l., 15 September 2021, rocky habitat, two adult individuals of unknown sex (CUHC-PA 219); Khilyazi payan near primary school, 37.4358°N, 69.7461°E, 765 m a.s.l., 15 September 2021, rocky habitat, one subadult individual (CUHC-PA 221).

Distribution in Afghanistan. It is known from Badakhshan, Badghis, Balkh, Farah, Faryab, Jowzjan, Kunduz, Samangan and Takhar Provinces (Wagner et al. 2016; Jablonski et al. 2019a, b, 2021), representing 26% of all provinces.

Chorotype. Turanian.

Remarks. The species is already known from Takhar Province (specimens CAS 120317-21, CAS 121069). This species could be confused with *T. caspius* or other species of the genus. Thus, the extralimital record of the species from Farah Province (NMW 15879) should be verified and genetic research covering different populations of northern Afghanistan is needed. In this context, we corrected the locality and coordinates mentioned by Wagner et al. (2016) for ZMUC R-34128. This specimen is from Fayzabad in Badakhshan Province, collected on 21 March 1949 (D. Scherz, pers. comm.).

Lacertidae

Eremias velox ssp. *velox* (Pallas, 1771)

Figs 6, 8

Takhar records. Bay Yawa (Sukhtedere), 37.4316°N, 69.7145°E, 692 m a.s.l., 27 February 2019, observed on the ground, under stones, in holes or near vegetation in semi-desert habitat, dozens of adults of both sexes (CUHC-PA 172); Bay Yawa (Sukhtedere), 37.4219°N, 69.7124°E, 822 m a.s.l., 4 April 2020, observed on the ground, under stones, in holes or near vegetation in semi-desert habitat, dozens of adults of both sexes (CUHC-PA 174); Bay Yawa (Sukhtedere), 37.4148°N, 69.7125°E, 733 m a.s.l., 17 March 2020, observed on the ground, under stones, in holes or near vegetation in semi-desert habitat, dozens of adults of both sexes (CUHC-PA 184); Bay Yawa (Qizilqiya), 37.4273°N, 69.7109°E, 711 m a.s.l., 31 January 2021, semi-desert habitat, one adult female (CUHC-PA 193); Bay Yawa, 37.4268°N, 69.7063°E, 812 m a.s.l., 31 January 2021, semi-desert habitat, one adult male (CUHC-PA 194); Bay Yawa, 37.4130°N, 69.7094°E, 747 m a.s.l., 31 January 2021, semi-desert habitat, one adult female (CUHC-PA 195); Khilyazi Payan, 37.4384°N, 69.7319°E, 705 m a.s.l., 13 September 2021, rocky habitat and dry stream, one adult male (CUHC-PA 209).

Distribution in Afghanistan. It is known from the Provinces of Balkh, Herat, Jowzjan, Kunduz, Logar, Nangarhar, Takhar and Zabol (Wagner et al. 2016), representing 24% of all provinces.

Chorotype. Turanian + Iranian.

Remarks. This species has high phenotype variability (Fig. 8) and is considered a species complex with un-nested taxonomy (Rastegar-Pouyani et al. 2012; Khan et al. 2021). Populations originating in Iran that are showing high levels of genetic diversity can be expected also from the Afghan territory. The disjunct character of the species' distribution in Afghanistan (north and south of the Hindu Kush; Fig. 5) suggests a geographic isolation with possible subsequent ecological or genetic divergence that should be tested. From the list of specimens of *E. velox* provided by Wagner et al. (2016), we excluded the specimen ZFMK 8584 (locality "Ost-Afghanistan, Prov. Ghazni, Dasht-e-Nawar, 3000 m N.N.") that is the holotype of *Eremias afghanistanica* Böhme & Szczerbak, 1991.

Scincidae

Eumeces schneideri (Daudin, 1802) ssp. *princeps* (Eichwald, 1839)

Fig. 6

Takhar records. Farkhar, Chashmay-e-Garmak, 36.4223°N, 69.9155°E, 1459 m a.s.l., 12 June 2020, rocky habitat in the river valley, one subadult individual of unknown sex (CUHC-PA 196).

Distribution in Afghanistan. The genus *Eumeces* (see Remarks) is known from Badakhshan, Badghis, Helmand, Kandahar (Wagner et al. 2016) and Takhar Provinces. This represents 15% of all provinces in the country.

Chorotype. Mediterranean + Arabian + Iranian + Turanian.

Remarks. This is the first-ever record of this species from Takhar Province. However, it is not exactly clear what species it is and where it is distributed in Afghanistan. According to recently published phylogeography of *E. schneiderii* (Faizi et al. 2021), two species of this group should be present in Afghanistan: *E. zarudnyi* (Nikolskii, 1900) [elevated to species status by Faizi et al. (2021)] in southern Afghanistan and *E. schneiderii princeps* in northern parts of the country (Fig. 1 in Faizi et al. (2021)). This suggests that Takhar Province is inhabited by the latter taxon. However, to come to this conclusion, we are missing good morphological or genetic data that could confirm our assumption. Wagner et al. (2016) report *E. blythianus* (Anderson, 1871) for Afghanistan, based on a single record and specimen (ZFMK 41118) from "Seberghan" (36.66°N, 65.75°E) in the northern part of the country. This record should be verified since we expect that the specimen could represent the *E. schneiderii* group due to its record north of the Hindu Kush mountains (*E. blythianus* is known mostly from Pakistan; Masroor (2009); Faizi et al. (2017)).

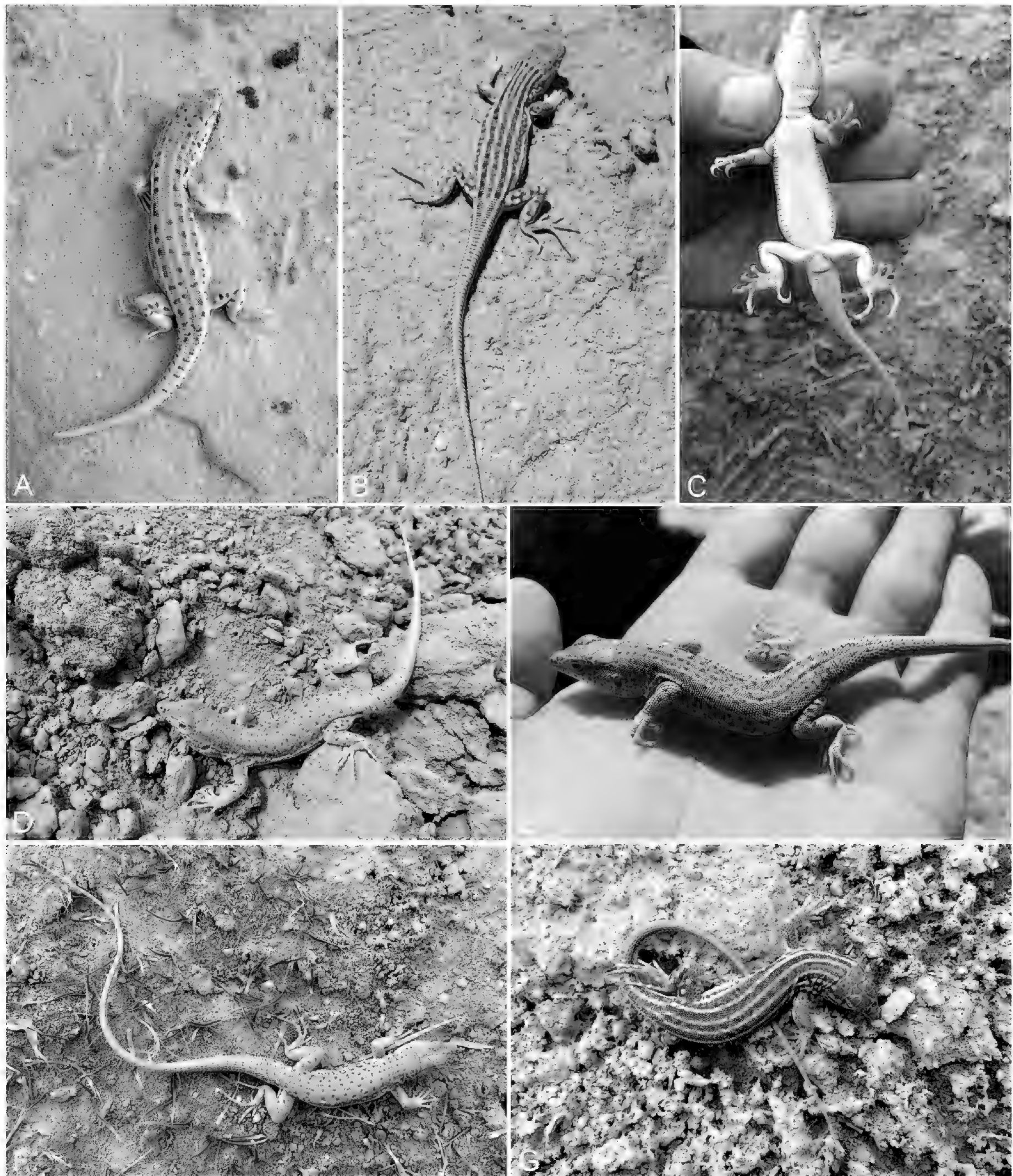


Figure 8. The phenotype diversity in the *Eremias velox* complex from Takhar Province: **A.** Adult male from Bay Yawa (Khilyazi Payin) (CUHC-PA 209); **B.** Subadult female from Bay Yawa (Sukhtedere) (CUHC-PA 172); **C, F.** Adult male from Bay Yawa (CUHC-PA 194); **D.** Adult female from Bay Yawa (CUHC-PA 193); **E.** Subadult male from Bay Yawa (Sukhtedere) (CUHC-PA 174), adult female from Bay Yawa (CUHC-PA 195).

Varanidae

Varanus griseus (Daudin, 1803) ssp. *caspius* (Eichwald, 1831)

Fig. 6

Takhar records. Bay Yawa (khujabilandi), 37.4203°N, 69.6961°E, 954 m a.s.l., 13 June 2014, grassy, semi-desert habitat, one adult individual of unknown sex.

Distribution in Afghanistan. The species has been recorded in Badghis, Balkh, Farah, Helmand, Herat, Kandahar, Kunduz (Eiselt and Adametz 1977, NMW; Wagner et al. 2016; Jablonski et al. 2021e) and Takhar Provinces. This represents 21% of all provinces in Afghanistan.

Chorotype. Saharan + Arabian + Iranian + Turanian + Indian.

Remarks. It is the first record of this species from Takhar Province. Although we only have a single doc-

umentation of this species, local people report *V. griseus* as common and it is regularly observed in the Bay Yawa area. The first record from the Kandahar Province is represented by the museum specimen NMW 34781/1, which is not mentioned in Wagner et al. (2016).

Erycidae

Eryx tataricus (Lichtenstein in Eversmann, 1823)

Figs 9, 10A, B

Takhar records. Bay Yawa (Keserkul), 37.4280°N, 69.7195°E, 685 m a.s.l., 29 May 2020, found in the arid habitat near water (CUHC-PA 188); Taleqan (Takhar University Campus), 36.7388°N, 69.4852°E, 792 m a.s.l., 17 September 2020, hilly area with the steppe vegetation, one juvenile individual of unknown sex (CUHC-PA 175); Bay Yawa Sharqi, 37.4337°N, 69.7538°E, 958 m a.s.l., 15 September 2021, rocky habitat, one adult individual of unknown sex (CUHC-PA 220).

Distribution in Afghanistan. This species has been recorded in Provinces of Badakhshan, Badghis, Faryab, Ghor, Helmand, Herat, Jowzjan, Kabul, Kunduz, Laghman, Nangarhar (Wagner et al. 2016) and Takhar. It represents 35% of all provinces.

Chorotype. Turanian.

Remarks. We bring the first record from Takhar Province that creates a connection to so-far isolated and surprisingly high elevated record (FMNH 161123) from Zebak “102.4 kilometres east of Faizabad”, (2653 m a.s.l.; 18 August 1965), Badakhshan Province (Anderson and Leviton 1969). More data are needed regarding the morphology and genetics of the species from Afghanistan to resolve its distribution. It can be confused with *E. elegans* (Gray, 1849), a similar species inhabiting mostly rocky habitats. Record provided by Boulenger (1889), i.e. “Afghanistan” cannot be exactly georeferenced.

Colubridae

Hemorrhois ravergeri (Ménétriés, 1832)

Figs 9, 10C, D

Takhar records. Bay Yawa (Keserkul), 37.4264°N, 69.7127°E, 734 m a.s.l., 1 April 2020, dead on the road, killed by local people, one subadult male (CUHC-PA 177).

Distribution in Afghanistan. The species is known from the Provinces of Badakhshan, Bamiyan, Herat, Kabul, Kandahar, Kunduz, Nuristan, Paktia (Wagner et al. 2016; Jablonski et al. 2019b) and Takhar. It represents 26% of all provinces.

Chorotype. West Asian Mountains transition zone + Turanian + Iranian.

Remarks. The here-presented record is the first of this species for Takhar Province. It is a common Central Asiatic snake, often found in a variety of habitats (Szczerbak 2003). Some Central Asiatic populations or

individuals are characterised by a black head (Tuniyev et al. 1997) which was also the case for the observed individual from Takhar.

Natricidae

Natrix tessellata (Laurenti, 1768)

Figs 9, 10E, F

Takhar records. Taleqan (Takhar University Campus), 36.7388°N, 69.4852°E, 775 m a.s.l., 14 September 2020, observed near the irrigation canal and rice fields around 11 p.m., one adult female eating *Pelophylax terentievi* (CUHC-PA 176); Bay Yawa (Parchaw Khana), 37.4088°N, 69.7346°E, 720 m a.s.l., 4 September 2021, stony shore near the water, juvenile individual of unknown sex (CUHC-PA 205); Bay Yawa, 37.4291°N, 69.7208°E, 681 m a.s.l., 9 September 2021, stony shore near water, one adult female (later killed by the local farmer).

Distribution in Afghanistan. The species is known from the Provinces of Badakhshan, Balkh, Bamiyan, Faryab, Herat, Jowzjan, Kabul, Kunduz (Wagner et al. 2016) and Takhar, representing 26% of all provinces.

Chorotype. Turanian + Siberian-European + Mediterranean + West Asian Mountains transition zone.

Remarks. Jablonski et al. (2023) studied populations of dice snakes from Central Asia including Afghanistan and found that their previously uncovered mitochondrial lineages (Guicking et al. 2009) are affiliated with specific river systems. The population from adjacent Kunduz Province has been affiliated to so-called Uzbekistan lineage distributed in the Amu Darya Basin. Moreover, Central Asiatic populations show deep divergence from populations from Europe and, thus, further taxonomical changes are possible with additional data. Our here-provided records are the first-ever documentation of this species for Takhar Province. The geographic origin of specimens BMNH 1938.2.4.12-14 mentioned by Wagner et al. (2016) is unknown. Thus, they cannot be included to the georeferenced dataset of the species from Afghanistan.

Elapidae

Naja oxiana (Eichwald, 1831)

Figs 9, 10G

Takhar record. Bay Yawa (Qizilqiya), 37.4267°N, 69.7085°E, 736 m a. s. l., 1 September 2019, observed on the sandy road during the evening and in the morning next day.

Distribution in Afghanistan. According to Wagner et al. (2016), this species is known from different parts of the country, mostly from the northern and south-eastern Provinces, i.e. Badghis, Herat, Kabul, Kunduz, Logar and Nangarhar (Fig. 9). It represents 18% of all provinces.

Chorotype. Iranian + Turanian + Palearctic-Oriental transition zone.

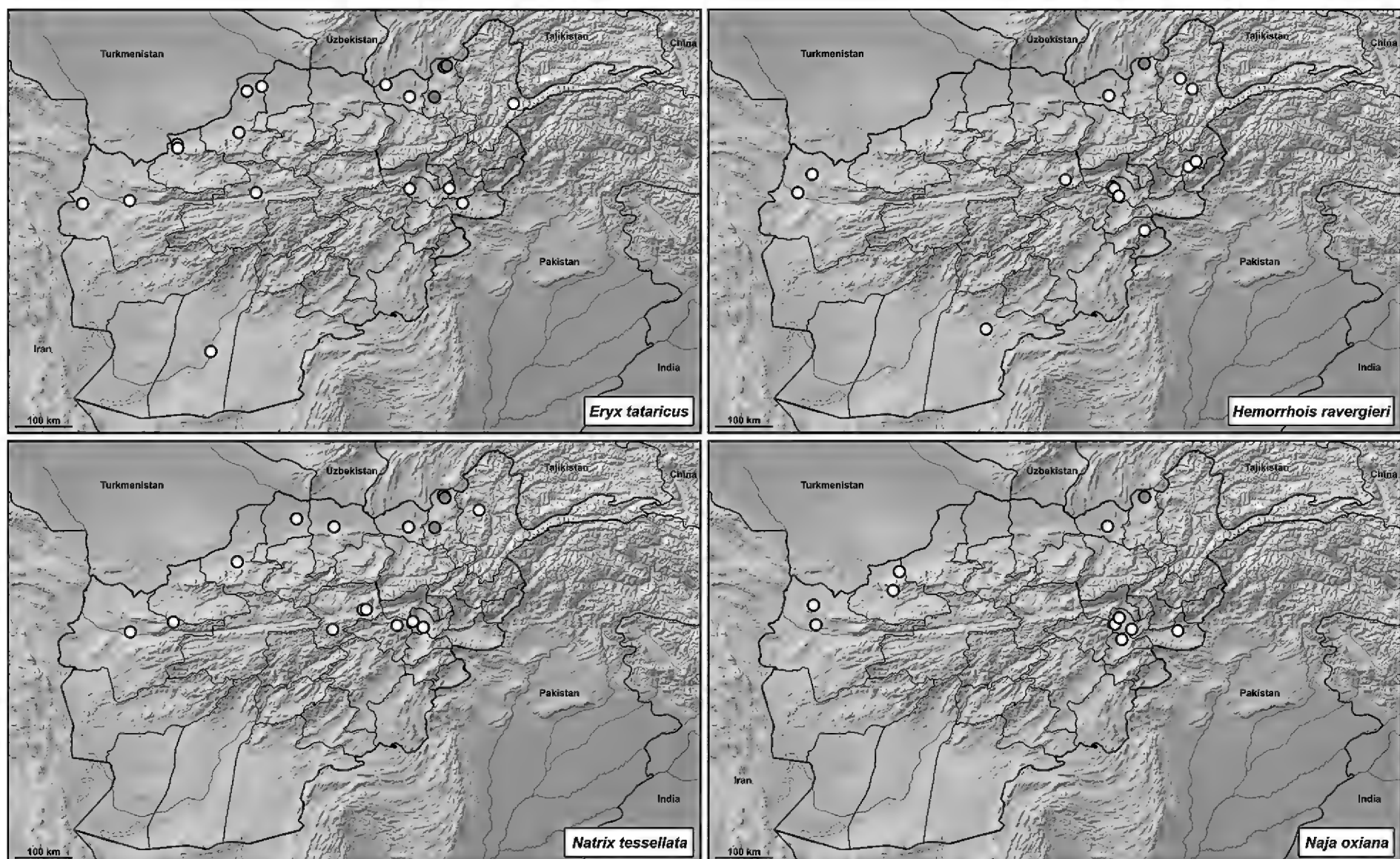


Figure 9. Herpetofaunistic records of Erycidae, Colubridae, Natricidae and Elapidae from Takhar Province in the context of updated records from Afghanistan (white dots: published data; red dots: new data).

Remarks. This is the first record of this species from Takhar Province. Kazemi et al. (2021) compared the genetic data of populations from northern Afghanistan with those from Iran and Turkmenistan and highlighted a shallow pattern of genetic variability suggesting ecological plasticity (the species is inhabiting variety of habitats) connected with rapid colonisation events in the past. However, populations south of the Hindu Kush Mountains were not studied and, due to this significant geographic barrier, we can expect the deeper genetic structure of the species.

Discussion

Our contribution brings a significant source of data for amphibians and reptiles from the poorly studied regions of Afghanistan, Takhar Province. Overall, we observed 14 species, two species complexes (*Bufotes viridis* complex and *Trapelus agilis* complex) and a population of *Paralaudakia* sp. that could not be assigned to any known taxa, based on available data. In the context of the overall lack of data on the species diversity and composition in the country (Jablonski et al. 2021b), such a dataset may contribute to better evaluation of ecologically important areas for conservation purposes sensu Johnson et al. (2012), primarily for the purposes of the National Environmental Protection Agency of Afghanistan.

The significance and simultaneously the rarity of data and poor field investigations are highlighted by the

fact that our study brings the first published records of snakes for Takhar Province, particularly for four species in four families: *Eryx tataricus* (Erycidae), *Hemorrhois ravergieri* (Colubridae), *Natrix tessellata* (Natricidae) and the highly venomous species *Naja oxiana* (Elapidae). Except for these species, we also recorded for the first time *Testudo horsfieldii* (Testudinidae), *Paralaudakia badakhshana* (Agamidae), *Pseudopus apodus* (Anguidae), *Tenuidactylus caspius* (Gekkonidae), *Eumeces schneideri* (Scincidae), and *Varanus griseus* (Varanidae). The most frequently recorded species were *Pelophylax terentievi* (nine localities), *Tenuidactylus turkmenicus* (eight localities), *Pseudopus apodus* and *Eremias velox* (both with seven localities). Other observed species were recorded in five or less localities. High abundances were recorded for *T. horsfieldii* (tens of individuals). Although none of these amphibians or reptiles is new to Afghanistan, our records supplement our previous knowledge and better explain the distribution patterns of several species (e.g. *P. apodus*, *E. tataricus*; cf. Wagner et al. (2016)). According to our data and comparison of known records, all recorded species are distributed only in 50% or less of Afghan Provinces, including Takhar. We also increased the knowledge of the herpetofauna of the Province by 50% (10 species). Finally, our results highlight that the herpetofauna of Takhar Province is composed of two species of amphibians and 18 species of reptiles (see Appendix 1) that strongly connect to the so-called Turanian or related chorotypes. The Turanian chorotype was exclusively recorded in six species (30%) and part-



Figure 10. A. Juvenile individual of *Eryx tataricus* from Taleqan (CUHC-PA 175); B. Adult female of *E. tataricus* from Bay Yawa (Kaserkul) (CUHC-PA 188); C, D. Dorsal and ventral view on subadult male of *Hemorrhois ravergieri* from Bay Yawa (Kaserkul) (CUHC-PA 177); E. Ventral view on adult female of *Natrrix tessellata* from Taleqan (CUHC-PA 176); F. Adult female of *N. tessellata* from Bay Yawa (CUHC-PA 206); G. Juvenile individual of *Naja oxiana* from Bay Yawa (CUHC-PA 199).

ly in 10 species (50%). This composition reflects the steppes and semi-desert habitats of the Province, typical for many parts of northern Afghanistan. Other species are represented by the Western Central-Asiatic Mountains chorotype (three species, 15%), Iranian chorotype (one species, 5%) or a combination of different chorotypes (see above).

Our data from the study area highlight the overall poor state of herpeto-faunistic investigations from Afghanistan. The country lies between Central and South Asia and is positioned to play a crucial role for understanding of the past historical dynamics related to current composition and diversity of amphibians and reptiles in the region. In this perspective, as an example to elaborate the in-depth understanding, few genera in the family Colubridae (*Oligodon*, *Ptyas*, *Lycodon*) have the core of their distribution in the Oriental zoogeographic realm, but these reach deeply into the territory of Central Asia (Tajikistan, Turkmenistan, Uzbekistan; Sindaco et al. (2013)) with limited or no records in the intervening areas of northern Afghanistan. We thus expect that the isolated distribution of these genera in Central Asia can be only a bias of data (or currently fragmented distribution), particularly their lack from Afghanistan (see Wagner et al. (2016); Jablonski et al. (2019b)). This is supported by a recently published study on populations of *Lycodon bicolor* (Nikolskii, 1903) from the southern and central Asiatic range as genetically closely related (Amarasinghe et al. 2023).

Besides, the importance of thermally suitable river and mountain valleys for species distribution and spreading in Central Asia is also highlighted in this study. A good example is *P. apodus* and *E. tataricus* and their possible ability to colonise high elevation areas as indicated, so far, by the isolated and almost 60 years old record in mountainous Badakhshan Province (Anderson and Leviton 1969). With the here-provided data from Takhar Province, we can say that such a record represents again a lack of data and thermophilic species may be present also in apparently less suitable areas. Thus, the comprehensive distribution and ecological limits of amphibians and reptiles in Afghanistan and Central Asia should be studied in the future in a broader sense. Despite Afghanistan being one of the most complicated countries for basic field research with many areas inaccessible, further biodiversity research combining basic field investigations and morphology with genetics is indispensable (Jablonski et al. 2021).

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Appendix 1

The updated list of amphibians and reptiles of Takhar Province (*this study).

AMPHIBIA

Anura

Bufonidae

1. *Bufotes turanensis* (Hemmer, Schmidtler, & Böhme, 1978)

Ranidae

2. *Pelophylax terentievi* (Mezhzherin, 1992)

REPTILIA

Testudines

Testudinidae

1. *Testudo horsfieldii* Gray, 1844 *

Squamata

Agamidae

2. *Laudakia nuristanica* (Anderson & Leviton, 1969)
3. *Paralaudakia badakhshana* (Anderson & Leviton, 1969) *
4. *Paralaudakia caucasia* (Eichwald, 1831)
5. *Paralaudakia lehmanni* (Nikolskii, 1896)
6. *Trapelus agilis* (Olivier, 1804)
7. *Trapelus sanguinolentus* ssp. *sanguinolentus* (Pallas, 1827)

Anguidae

8. *Pseudopus apodus* ssp. *apodus* (Pallas, 1775) *

Gekkonidae

9. *Tenuidactylus caspius* (Eichwald, 1831) *
10. *Tenuidactylus turcmenicus* (Szczerebak, 1978)

Lacertidae

11. *Eremias nigrocellata* Nikolskii, 1896
12. *Eremias velox* ssp. *velox* (Pallas, 1771)

Scincidae

13. *Eumeces schneideri* (Daudin, 1802) ssp. *princeps* (Eichwald, 1839) *

Varanidae

14. *Varanus griseus* (Daudin, 1803) ssp. *caspius* (Eichwald, 1831) *

Erycidae

15. *Eryx tataricus* (Lichtenstein in Eversmann, 1823) *

Colubridae

16. *Hemorrhois ravergieri* (Ménétriés, 1832) *

Natricidae

17. *Natrix tessellata* (Laurenti, 1768) *

Elapidae

18. *Naja oxiana* (Eichwald, 1831) *

Supplementary material 1

The source distribution data for species maps (without new data obtained from Takhar Province in this study)

Authors: Daniel Jablonski, Faizurrahman Khalili, Rafaqat Masroor

Data type: excel file

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